Leaptronix®

IWT Series User's manual

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Chapter 1 Product Description

1-1 A Brief Introduction of the Product

Ever since its foundation in 1980, Leaptronix has dedicated to the services of IC programming and measurement, aiming to provide the manufacturer with an integrated R&D environment and high-quality measurement instruments.

With a view to the measurement requirements of various products in the digital times, our company further cooperate with different industries, and set up Leaptronix so as to provide the most important analyzers such as logical analyzer series and passive component analyzer series: the passive component analyzer series products are represented by IWT Series.

IWT Series, Impulse winding component tester is a coil testing instrument with self-insulating property, which can be used to test the insulating situations of coil layers, jumpers and jacks caused by winding materials, magnetic materials and framework. 200V~5000V programmable pulse voltage setting, 100MHz high-speed sampling rate, non-destructive testing, etc, can detect ill-insulating winding components.

1-2 Security and Cautions

All the operations, repair and maintenance services must abide by the following security precautions. Any unexpected situation caused by misuse of this instrument due to failure of compliance with the precautions shall eliminate our responsibilities.

For the safe usage of the instruments, the following precautions should be strictly observed.

1. Installation environment of this instrument

Please don't place heavy and massive objects on the top of this instrument. The back of this instrument is equipped with fans for internal heat extraction. Please do not block the vent-hole on the flanks.

2. Strict compliance with power standard

Please ensure the stability of power supply. Any instability of power supply may cause damage of this instrument.

To ensure the safety of power supply, please strictly follow the standard voltage.

3. Grounding

For the sake of safety, please maintain proper grounding, or ground the standard power cable grounding terminal attached with the instrument.

4. Do not touch the internal parts with hands

Please do not open the housing of this instrument. It's dangerous to touch manually the internal parts with high voltage, which may possibly cause failure.

5. High voltage test line

On the back panel of the instrument, there is high voltage test line. During testing, the testing cable and the test object carry high voltage. Please do not touch the testing terminal and the test object to avoid electric shock.

6. Handling and transportation

During handling and transportation, it's required to pull out the plug from the socket and ensure the connection state of high voltage cable and external control cable. To avoid extra forces on the handle during transportation, please lift by keeping this instrument in a vertical state.

7. Cleanliness

This instrument employs plastic and coating components. If these parts are stained, do not clean with solvents such as diluents or gasoline. Please clean by soft cloth material with water or a little neutral scouring agent.

8. Placement environment

To avoid deformation of plastic components and internal temperature rise, please keep it away from direct sunshine, heat apparatus and stuffy environment. In addition, please avoid high-humidity and dust-rich places due to high voltage. Please try to place in the environment with little temperature variations around normal temperature (23℃).

1-3 Overview

Thanks for your purchase of IWT series pulsed coil tester. For flexible and proper use of this tester's full functions, please read this manual carefully before use to learn about the functions and operations of this instrument.

1-4 Introduction

With regard to the coiled products such as transformer and inductors, insulation reduction between the layers of coils, between the lines or between the outgoing lines will be caused by winding materials, magnetic materials, coil holders and processing procedures. The pulsed coil tester is designed to store the sampling waveforms of standard coil waveforms into the instrument. During the test, the waveforms of the test coils are compared with the standard waveforms. The performance of the test coils is determined by the comparable parameters (area ratio, area-difference ratio, corona amount and corona number).

1-5 Principles of the pulsed coil tester

The pulsed coil tester is used to test the electric characteristics without damage of the objects. The principles: apply the same pulse voltage to the Sample Coil and Test Coil, compare the instant waveforms of the two waveforms to judge the performance of the test object. The instant waveforms refer to the damped attenuation oscillation waves generated within the coils, which can be used to identify the inductance value, quality factor Q value as well as coil number differences, turn-to-turn short-circuit, metal core material differences. If high voltage pulse is applied, corona discharging can also identify the poor insulation.

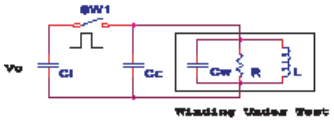


Figure 1: Illustration of coil pulse testing principle

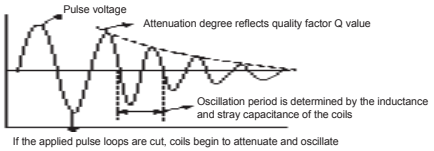


Figure 2: Typical self-attenuation oscillation waveform of coils

1-6 Specifications and Features

MODEL	IWT-5000A
Output pulse voltage	500V~5000V (100V Setp) 3%±10V
Inductance range of test coil	>0.2uH
Pulse energy (Joules)	Max 250milli
Sampling velocity	8bit/10nS (100MHz)
Sampling memory depth	5K/Byte
Sampling levels	10-level
Test input resistance	10MΩ
Display range	5. 7 inch 320*240 TFT
Comparison measures	AreaSize Comparison DiffZone Comparison Corona Amount Comparison Corona Number Comparison
Standard waveform storage volume	360
PC Link interface	USB 2. 0
HANDLE External I/O interface	TTL I/O, Standard D-Sub 15 Pin
Commend Interface	RS232, Standard D-Sub 9Pin (Master)
Applied power	AC110V/220V, 50HZ/60HZ
Fuse	AC220V/2. 0A
Working temperature	25℃~40℃(77℉~104℉)
Power consumption	20W
Dimension	31 (W) x16.1 (H) x18(D) cm 5.1kg

1-7 Introduction of Comparison Methods

1-7-1 AREA SIZE

In the randomly selected interval, waveform area is compared between the standard coil and test coil. As illustrated by Figure 3, the total area of A-B interval can be calculated to identify the difference degree of the two areas. The judgment standard is set by percentage (%). Quality products are those with satisfactory calculation results. The inner interval area is in proportion to the energy consumption within the coils, so it can be used to judge the energy consumption.

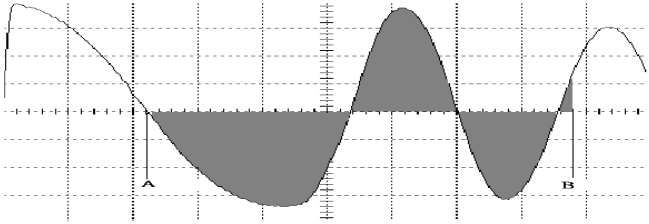


Figure 3: Sketch map of area comparison method

1-7-2 DIFFERENTIAL AREA

In the randomly selected interval, the differential area between standard coil and test coil is calculated. As illustrated by Figure 4, the area difference of A-B interval can be calculated to compare the standard wave (as Figure 3) and identify the deviation degree. The judgment standard is set by percentage (%).Quality products are those with satisfactory calculation results. The waveform deviation area reflects the sum of the inductance value and the energy consumption degree. For example, this judgment method can effectively test the differences of inductance value L.

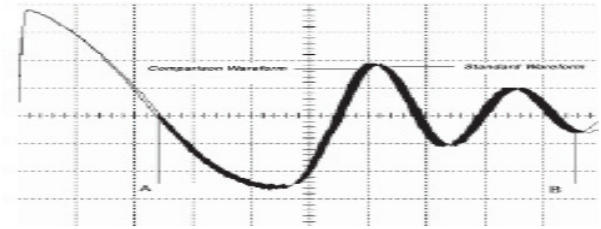


Figure 4: Sketch map of area difference comparison

1-7-3 Corona Discharging Amount & Corona Discharging Number

In the process of high voltage pulse testing, the test coil may lead to point discharge due to material damage, thus generating corona phenomenon in the discharging curves. Statistics is made with respect to the frequency of corona generations, which can be called as Corona Discharging Number.

The waveform difference can be basically ignored. As illustrated in Figure 5, only the high frequency parts, such as Corona Discharging Amount, is tested. It's also required to test the corona of the waveform in randomly selected interval, and judge according to the deviation degree. The judgment standard is set by integral value. Quality products are those with satisfactory calculation results. The testing method permits numerical calculation in a programmed way. The area is counted in reference to differential calculus waveforms. In the simulation mode, it can be regarded as the tested volume subject to high frequency filter.

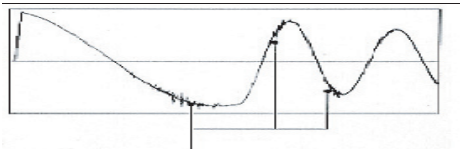


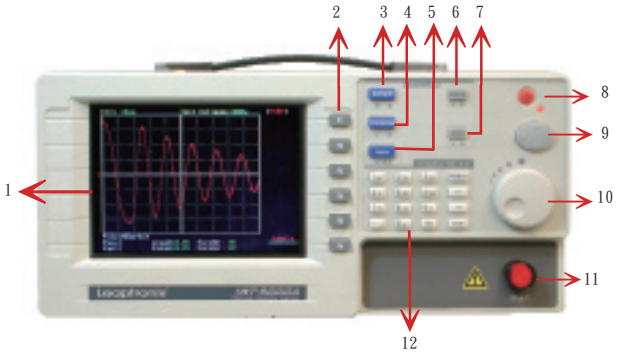
Figure 5: Sketch map of corona discharge comparison

1-8 Accessories of IWT Series products

NO	Name of the accessories	Quantity	Remarks
01	Product package check list	1	Detailed product package content
02	CD-ROM	1	Including PC software, driver, and user's manual
03	Warranty card	1	
04	AC power cord	1	Three-wire power cord
05	RS-232 Cable	1	
06	High voltage test line	2	One is red and the other is black
07	IWT Main unit	1	

Chapter 2 Panel and Display

2-1 Illustrations of Front Panel



1. 5. 7" inch. Colored TFT LCD Screen.

2. F1~F6 Function Buttons F1 F2 F3 F4 F5 F6
   Detailed function buttons, which shall be connected to the function buttons on the panel to adjust internal function options.

3. Sample Button Sample
   Test voltage range and sampling frequency setting and average frequency setting.

4. Comparison Button Compare
   Set the categories of comparison parameter (area ratio, area difference ratio, Corona number ratio and Corona amount ratio).

5. Auto Measurement Auto
   Automatically sample the waveforms with optimized sampling rates.

6. Memory Button Memory
   Store the waveforms & parameters.

7. System Button System
   Set system parameter.

8. POWER & LED
   The major power button of the instrument, when the power is ON, it reflects LED as red spot.

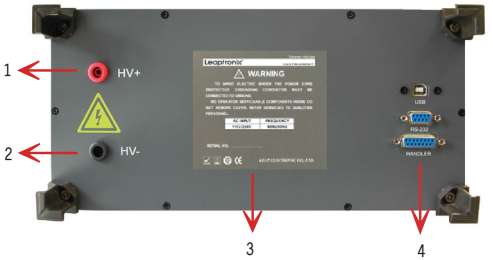
9. Direction Button
   Adjust voltage setting and sampling rates.

10. Rotary encoder
    Adjust voltage setting and sampling rates.

11. Testing High Voltage START Button
    Sampling and testing high-voltage start-up button.

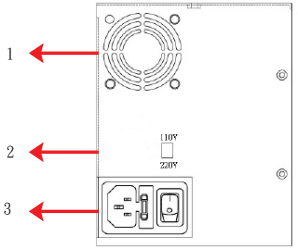
12. Digits and Character Input Button Start
    Use to input digits or character edit function.

2-2 Illustrations of Back Panel



1. HV+ Testing Terminal: high voltage output terminal. Do not touch during testing.
2. HV- Testing Terminal: GND Point
3. Warning Sign
4. Nameplate: cautions description, logging of manufacture date, type of machine, serial number description and safety rules indication.

2-3 Illustrations of Side Panel



1. Heat Extraction Fan:
   The fan is used to adjust the temperature increase and decrease inside the machine body. Please do not block the vent-hole.
2. AC Power Selection:
   Choose AC power categories. Confirm AC power is 110V or 220V and switch to the proper position.
3. AC input power switch (0: OFF, 1: ON): This is the AC power switch. When it is ON, the power button on the front panel can be effectively controlled.
   AC Fuse: 250V-2A, containing an alternative fuse.
   AC power cord three-wire socket.

Chapter 3 Installation

3-1 Pre-installation Inspection

1. The instruments have undergone precision test and examinations before leaving factory. It's still required to check if there is any abnormal situation after opening the box and before use, so at to confirm that there is no damage during transportation. Then, the instruments can be put into operation.
2. Check if the items and quantities of all accessories are complete and intact according to different accessory lists. Otherwise, it's required to report immediately to our company, or local agent or distributor for proper handling.

3-2 Placement Locations and Application Locations

1. The instrument's circulative heat-extraction system is formed by the fan and air holes on the shell. During operation, it should be placed in a ventilated environment. Do not block the circulative heat-extraction inlet and outlet air holes.
2. The operating environmental temperature: within the range of 0℃~45℃.
3. During operation, the instrument may generate magnetic field. Other instruments placing nearby may interfere with each other. If this phenomenon occurs, please separate these two instruments at least 10cm and keep far away from the high magnetic field or possibly interference range during its operation.

3-3 Input Power Specifications

1. Before connecting to AC power, please ensure that the applied AC voltage complies with the acceptable input voltage specifications. The instrumental input voltage has been marked on the literal illustrations of the back panel.
2. This instrument allows input power with AC 110~220V, 50/60Hz.
   * Note! Please ensure that the instrument voltage complies with the input voltage specifications at first.

3-4 Employment of Alternative Fuse

If alternative fuse is to be employed, please confirm the fuse specifications at first:

1. Fuse specifications: 240V/2.0 Amp.
2. Inside the product is attached another specification in the fuse socket.
   * Note! During self purchase and change of the fuse, the standard specifications should be followed. In the case of failure to abide by the standard specification fuse, instrument damage may be caused.

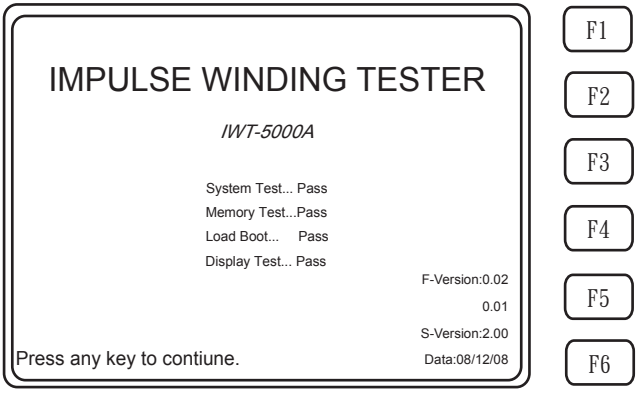
Chapter 4 Functions

4-1 Connection proceedings

1. Connect the high voltage testing lines to the high voltage output terminals illustrated as HV+, HV- in the rear part of this instrument.
2. Ensure that the high voltage testing lines are firmly connected to the instrument. If not properly fixed, tests will fail.
3. Connect the DUT to the high voltage testing lines.

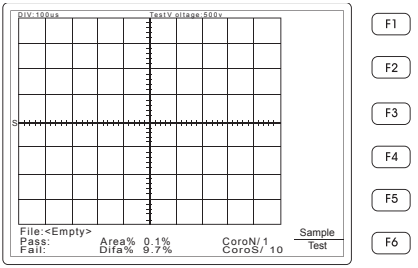
4-2 Starting-up Frame

1. After power-on, the instrument will undertake self-examination and scanning within approximately 3 seconds. After that, the version of the software will display at the right lower part of the frame.



2. After the starting-up process, press any key to enter the main frame

4-3 Function Illustrations of Main Frame



NO	Items	Function Description
1	DIV	The set velocity of sampling ratio.
2	Test Voltage	The set output voltage value.
3	xxxV	Actual voltage value under the Sample mode.
4	File	The loaded file name; if no file name exists, it will display Empty.
5	Pass	Representing the quantity of Pass under the Test mode, Max=999999.
6	Fail	Representing the quantity of Fail under the Test mode, Max=999999.
7	Area%	The set value of area ratio, Min=0. 1, Max=99. 9%.
8	Difa%	The set value of area difference ratio, Min=0. 1, Max=99. 9%.
9	CoroN/	The set value of Corona Number ratio, Min=1, Max=999.
10	CoroS/	The set value of Corona amount ratio, Min=1, Max=999.
11	Sample/Test	Set the Sample mode or Test mode, use the F6 key or direction key (up and down buttons), select the test mode. (Note 1) (Note 2)

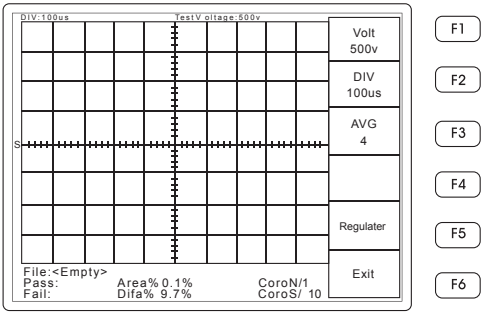
* Note 1:
  Under the Sample mode, any parameter value on the instrument can be set. But if there is waveform data on the LCD, changing any parameter value under the Sample function key will cause deletion of data on the LCD. Reloading or reacquiring new data will be required.
* Note 2:
  Under the Test mode, it will only be allowed to set the parameters of Compare function key and System function key.

4-4 Illustrations of Panel Function keys

4-4-1 Sample Control Key

Sample

Is the voltage setting key, sampling velocity setting key and average frequency key. Press the Sample Key. On the right side of the LCD, there are 6 function frames which correspond to F1~F6 function keys. The functions of the function keys:



F1

Volt setting: Set the output voltage by employing the rotary encoder or direction key. The voltage range is 200V (Min) ~5000V (Max), per 100V/Step.

F2

DIV (Sampling rate) setting: Set ADC sampling velocity by employing the rotary encoder or direction key. The sampling velocity range=250nS/DIV (Min) ~250uS/DIV (Max).

F3

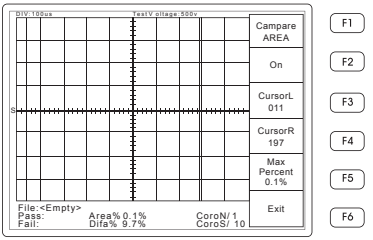
AVG setting: Set high voltage test frequency and average frequency by employing the rotary encoder or direction keys. Min=1 time, Max=15 times.

F6

Exit setting: Leave this function key option. After selection, it will return back to the main frame.

4-4-2 Compare Function Key

Compare Comparison Methods Setting Key: Set the four comparison methods of AREA, D_AREA, CoroN and CoroS. Press Compare key. On the right side of the LCD, there are 6 function frames which correspond to F1~F6 function keys. The functions of the function keys:



F1 Parameter setting switch of four comparison methods: AREA, D_AREA, CoroN and CoroS.

F2 ON/OFF option key of four comparison methods function.

F3 CursorR (left cursor) set area, area range comparison. The setting range of left and right cursors is regarded as the comparison range, which is adjusted by employing the rotary encoder or direction keys.

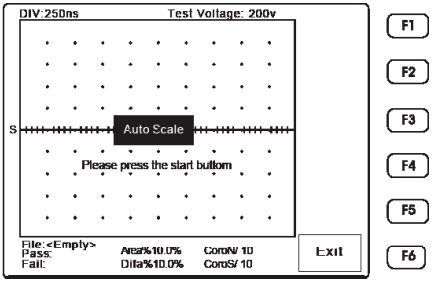
F4 CursorL (right cursor) set area, area range comparison. The setting range of left and right cursors is regarded as the comparison range, which is adjusted by employing the rotary encoder or direction keys.

F5 Set the parameter value of comparison method and four comparison methods of AREA%, D_AREA%, CoroN and CoroS. The error under the Sample and Test modes can be set by employing the number keys, rotary encoder and direction keys.
AREA% set value: Min=0.1%, Max=99.9%.
D_AREA% set value: Min=0.1%, Max=99.9%.
CoroN set value: Min=1, Max=999.
CoroS set value: Min=1, Max=999.

F6 Exit setting: Leave this function key option. After selection, it will return back to the main frame.

4-4-3 Auto Function Key

Auto It is automatic adjustment key: optimized sampling rate can be selected through automatic testing function of the IWT, enabling the user to observe the best waveform data option key. Actions can be made only in combination with the START key. Press the Auto key. On the right side of the LCD, there are 6 function frames which correspond to F1~F6 function keys. The functions of the function keys:

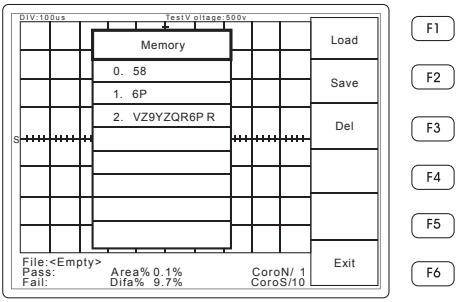


F6 Exit setting: Leave this function key option. After selection, it will return back to the main frame.

4-4-4 Memory Function Key

Memory

Storing, loading and deleting function key: Store the waveform data on the LCD screen to the internal memory or load up to the LCD screen, delete the data within the internal memory. Press the Memory key. On the right side of the LCD, there are 6 function frames which correspond to F1~F6 function keys. The functions of the function keys:



F1

Load Setting Key:

1. Load the parameters and waveform data within the internal memory to the LCD screen, and employ the rotary encoder to choose the name of the level or key in the file name that has been stored in IWT Memory.
2. Or by pink selection frame, choose the file name of loading. After then, press Enter key to start waveform loading, you will find the loading file name in the options on the main frame of the LCD.
3. Use “Search” function to find stored file and then load the file

F2 Save Setting Key:

1. Save all the parameter setting values and waveform data on the LCD screen to the internal memory. By employing number keys & letters, press the → key on right of the number keys, continue to enter the next character.
   ← is to backspace one character. Enter the file name to be saved, with at most 10 characters. Press Enter key to save and it will pop the check list, please press the F1 key once again to confirm storage.
2. LCD screen needs waveform data. If no waveform data exists, the software will not allow saving. The data file number for saving is 360

Note: Some models' waveform storage volume is 100 sets.

3. When a file name is saved repeatedly, IWT will show a message to make sure that user wants to cover the existing file or not F1(Yes): Load the file; F2(No): Not to load the file.

F3 Del Setting Key:

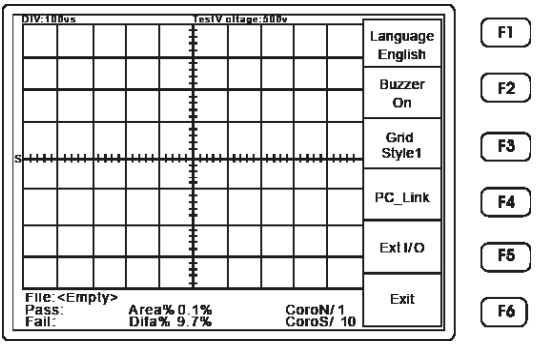
1. Delete the data saved in the internal memory, and employ the rotary encoder to choose the name of the level to be deleted.
2. Or by pink selection frame, choose the file name of deletion. After then, press Enter key to start waveform deleted.
3. The instrument's internal memory need to existed data. If there is no data exist, will not allow deletion.

F6 Exit setting: Leave this function key option. After selection, it will return back to the main frame.

4-4-5 System Function Key

System

The instrument system's internal setting key: Set Language, Buzzer, PC_ Link, Ext I/O, four settings. Press the System key. On the right side of the LCD, there are 6 function frames which correspond to F1~F6 function keys. The functions of the function keys:



F1 Language Setting Key: Set the operation interface language, with options of English and traditional Chinese.

F2 Buzzer Setting Key: Set the Test mode if Pass/Fail has buzz.

F3 Grid style Setting Key: There are 3 grid styles.

F4 PC_Link Setting Key: Set control key with PC link software.

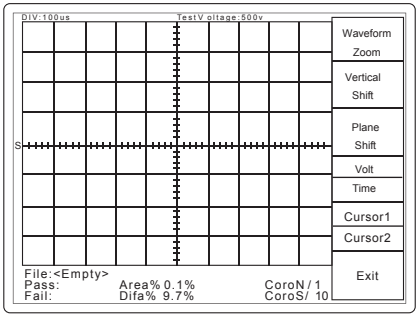
F5 Ext I/O Setting Key: Connect to the external I/O circuit.

F6 Exit setting: Leave this function key option. After selection, it will return back to the main frame

4-4-6 Analyzer Function Key

Analyzer

Waveform analyzer setting key: Before action, the screen needs waveform data. It can be used to analyze the waveform by employing the Cursor to measure the voltage.



F1 — Level zooming function key: According to different DIV, it allows different range adjustment by employing the rotary encoder.

F2 — Vertical adjustment function key: Adjust the vertical axis waveform with adjusting range of around 28Pixel by employing rotary encoder.

F3 — Level displacement adjustment key: According to different DIV, it allows visible backward adjustment by employing the rotary encoder.

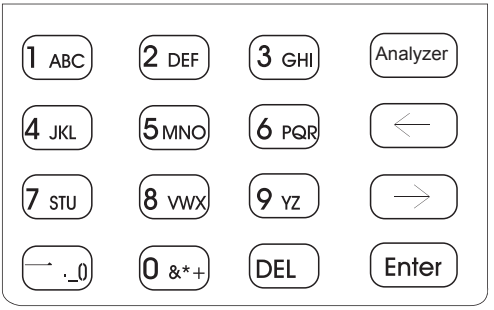
F4 — Voltage / time adjustment key: Based on the analysis of the need for users to choose options.

F5 — Cursor1 voltage/ time analysis key: Measure the waveform voltage/ time value by employing the rotary encoder.
Cursor2 voltage/time analysis key: Measure the waveform voltage/ time value by employing the rotary encoder.

F6 — Exit setting: Leave this function key option. After selection, it will return back to the main frame.

4-4-7 Function Illustrations of the Character Keys

Number/ Character/ Symbol Keys:



1. Number/ Character/ Symbol Keys: 0,1,2,3,4,5,6,7,8,9. Each number key contains English characters or other symbols, which can be represented by pressing this key in sequence.

2. DEL Key: delete undesired character.

3 → Key: Right key; ← Key: Left key.

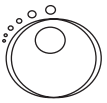
4. Enter Key: enter key.

5. Analyzer Key: Waveform analysis key

4-4-8 Illustrations of Special Function Key

UP, DOWN, LEFT, RIGHT, Direction Keys:

1. 〝Λ〞 、 〝V〞 UP and DOWN keys can set the parameters
2. 〝<〞 、 〝>〞 LEFT and RIGHT keys can adjust the movement of the cursors.



The main function of the rotary encoder: Change the parameter values according to the parameter settings.

Function Keys: F1~F6

F1 F2 F3 F4 F5 F6

(1) According to the Sample/Compare/System/Auto/Memory/Analyzer Keys, set the desired Function Keys F1~F6.

(2) F6 Key can be chose the Sample mode or Test mode to carry out the test.

(3) "Start "Key: is the control key of high voltage output. It acts only when released.

Note: If the DUT damage or inductance value is lower than the test range, the screen would be a "Sampling Failed to try again!"

4-4-8 Illustrations of Special Function Key

1. When Starting up the instrument by pressing the power control switch , the system will load the previous system parameter value.
2. When shutting off the instrument by pressing the power control switch , the system will save the current system parameter value.

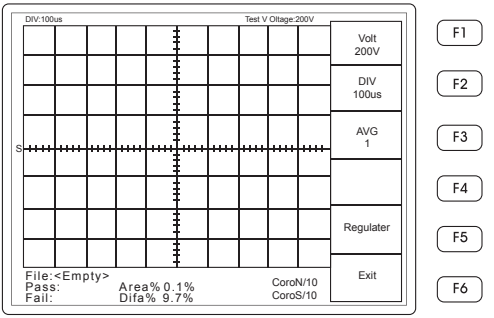
Note: Do not turn IWT off while saving data, otherwise IWT would be easily damaged.

Chapter 5 Voltage Calibration Procedure

5-1 The way to execute Voltage Calibration

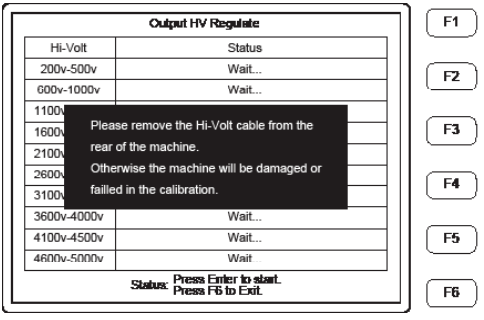
IWT may lose voltage accuracy due to long term operation. IWT series contains a “High voltage self calibration” function that helps users re-adjust output voltage and make the test more accurate and smoother.

1.Press “Sample” function key after powering IWT on. Press F5 to select “Calibration”. (Refer to Chapter 4-4-1 to know detailed information about “Sample” function list.)



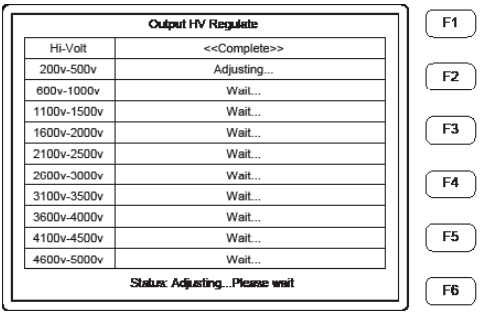
2.After execution of calibration, LCD shows calibration details. (As the following photo).

1. Note: Be sure to remove the high voltage test cables behind the unit to guarantee calibration accuracy and avoid damaging the unit as well as failing the calibration.
2. When IWT is running self calibration, do not access the high voltage output terminals behind the unit to avoid electronic shock accident. Before calibration, make sure that the high voltage test cables are removed from IWT

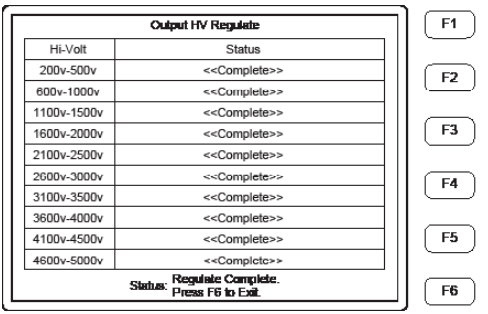


5-2 Enable High voltage self calibration

1. After removing high voltage test cables, press “Enter” to start calibration or press “F6” to quit calibration. After pressing “Enter”, IWT starts to run self calibration automatically and adjust voltage values.
   (When IWT is running self calibration, do not turn IWT off, otherwise IWT would be easily damaged.)



2. After self calibration is finished, press “F6” to quit.



Chapter 6 Operation and usage

6-1 Fast Operations

Fast Operations Flow Chart

1.Check the type, external appearances and components of the instrument.

↓

2.Ensure the input power specifications comply with the instrumental spec.

↓

3.Power starts up the instrument and self-test finishes.

↓

4.Set the voltage, sampling rate and average setting values under the Sample mode.

↓

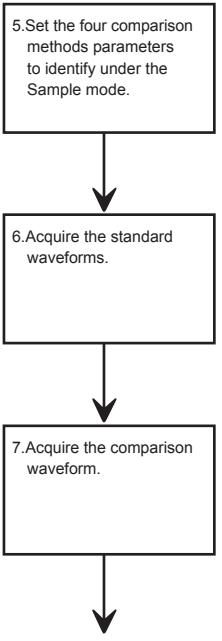
Fast Operations Illustrations

1. Check if the instrument is in proper and normal state.
   a. Check if the types and components are complete.
   b. Check if the external appearances of the instrument are intact.

2. Confirm the instrument input power specifications.
   a. Ensure that the applied instrument power specifications comply with the external input AC specifications.
   b. Connect the AC power cord (three-wire) attached with the product.

3. Start-up Test
   a. Turn on the power switch on the left part of the panel, from "0"→"1".
   b. Press the power control button on the upper right part of the front panel. Normal startup will hear buzzer 2 times and see the highlighted power indicator.
   c. After several seconds of system self-testing, the frame will automatically shift to the operation display.

4. Voltage Settings under the Sample mode.
   a. After pressing the Sample key, F1~F6 can be used to set the testing voltage, sampling rates and average values.
   b. The shuffle key can be used to adjust the required parameters of different parts.
   c. Press F6 to leave the Sample setting.



5. Set the range of four comparison methods under the Sample mode.
   a. After pressing the Compare Key, F1~F6 can be used to set four comparison methods: ON/OFF, comparison range and error comparison.
   b. The rotary encoder & direction keys can be used to adjust the required parameters (range, deflection value).
   c. Press F6 to leave the Sample setting.

6. Acquisition of standard waveforms.
   a. Connect the DUT to high voltage testing lines.
   b. Check if the testing lines are properly connected.
   c. Press the Start Key, the testing procedure begins.
   d. During the test, do not touch the high voltage testing lines to avoid electric shock.

7. Interception of comparison waveforms.
   a. Press F6 Key or Direction Keys (UP and Down keys) to select the Test mode for test.
   b. Connect the DUT to high voltage testing lines.
   c. Check if the testing lines are properly connected.
   d. Press the Start Key, the testing procedure begins.
   e. During the test, do not touch the high voltage testing lines in case of electric shock.
   f. The instrument will compare the standard waveforms with the test waveforms according to the set parameters of the four comparison methods. The LCD will display Pass or Fail.

Chapter 7 Connection and use of PC-LINK

7-1 PC-LINK Installation

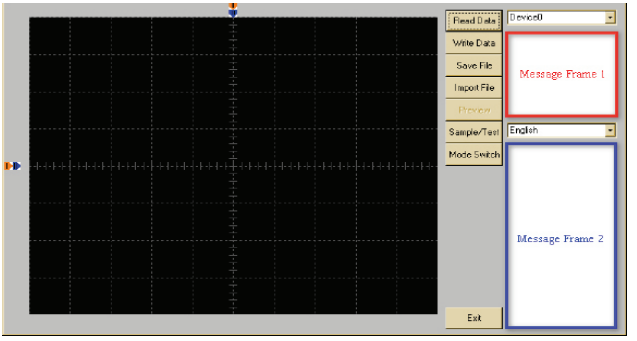
1. The major function of PC-Link is to transmit the waveform data acquired from the IWT upload to PC for storage, observation and printing.
2. PC-Link employs USB 2.0 as its communication interface. Before operation, it needs to install USB 2.0 Driver.
3. Install the PC-Link application software attached with IWT (or downloaded from the Download Zone of the Leaptronix Website) to the PC.
   "Decompress the downloaded compressed files, you will find an executable file for software installation (Setup. exe) inside the data folder. After execution, it will be OK after finishing the displayed procedures on the PC screen."
4. After installing the IWT software, you will find an IWT software icon on the PC. It shows that the installation has finished.

7-2 PC-LINK Operations

1. Connect the USB Cable to the USB Connector between the IWT and PC terminal.
2. Under the situation that IWT host machine has acquired the standard waveforms or comparison waveforms, the waveform data can be observed by loading up to the PC terminal through USB 2.0 interface.
3. After pressing the System Key at the IWT host machine terminal, the right part of the LCD screen will display: F1~F6 function options. F3 is selected with PC-Link functions. After pressing F3, IWT host machine terminal will be ready to upload the waveform data up to the PC terminal.

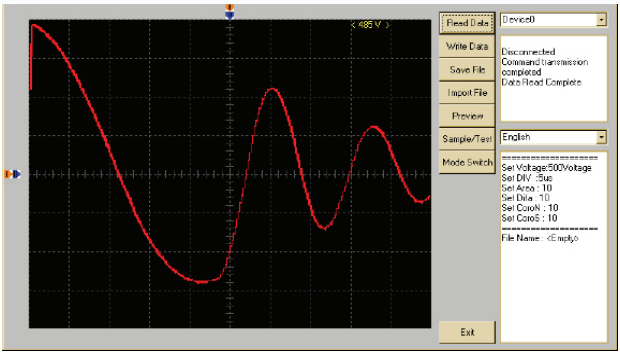
7-3 PC-LINK Software Operations

1. Click IWT icon and then enter the following IWT operation display:

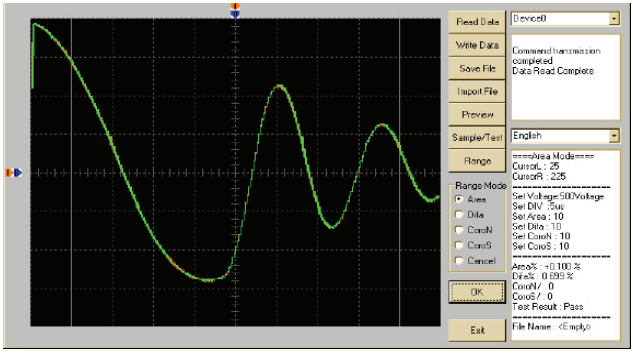


2. Illustrations of function keys:
   - Main frame: display the loaded waveform data section.
   - Reading data: upload the instrument's waveform data & parameter settings to the PC terminal software.
   - Saving parameters: store the instrument's waveform data & parameter settings onto the PC, with a file format: .arg.
   - Loading parameters: load the parameter data of the PC terminal to the instrument.
   - Printing preview: print the waveform data and parameter data on the software.
   - Sample/Test: display the waveform data under the Sample mode or Test mode.
   - Mode shift: shift the two window settings between the waveform display & range display.
   - Message Line 1: display whether there is any online data message column.
   - Message Line 2: display all the parameter setting values & parameter values after comparison.
3. After entering the software frame, accessing data needs to set the instrument at the online state.
4. After the PC terminal software detects the hardware, it will display the Device message on the Message Line 1, which indicates the hardware is online.

5. Accessing data key will upload the instrument data to the PC terminal, as illustrated in the following picture (Sample data parameters):



6. After comparison, all the parameter data will display on the Message Line 2.

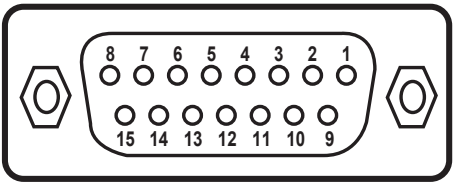


7. Illustrations of Printing Function:
   After pressing the printing preview on the software of the PC terminal, it will print out all software data.
8. Illustrations of Exit Operation
   (1) Click "Exit" to exit the software.
   (2) Press F6 Exit key from IWT instrument to exit PC-LINK.
   (3) Software will return to the Windows operating system.

Chapter 8 External I/O Control of Handler

8-1 Illustrations of HANDLER Connector Control Pins

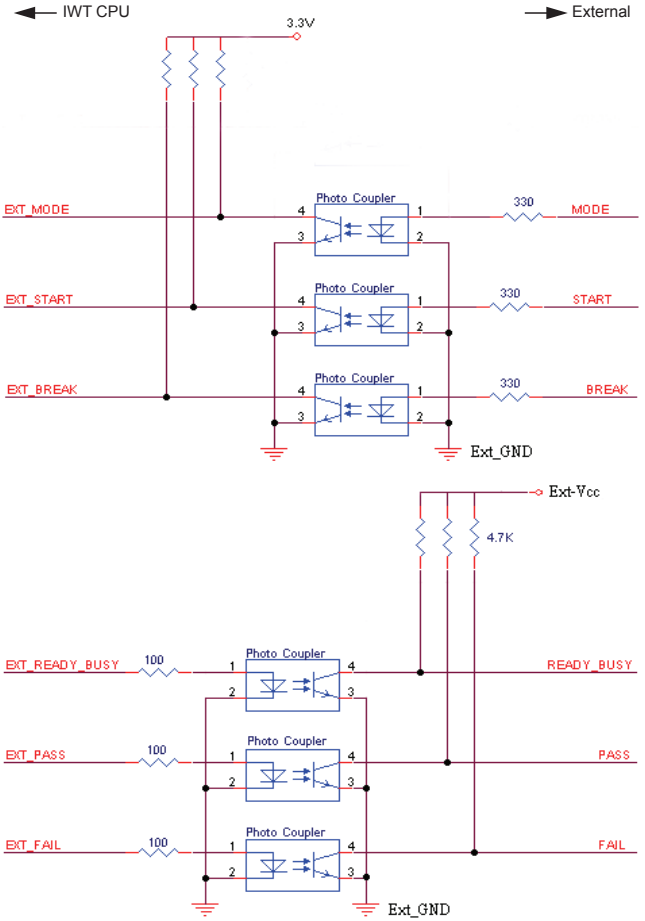
The external I/O HANDLER of this instrument adopts standard D_SUB 15-pin connector female header. I/O pins are illustrated as follows:



Pin1 (EXT_GND): On the reference ground of instrument's EXT_Vcc, please refer to the HANDLER I/O message & circuit diagram.
Pin2 (/PASS I/O): output signal, instrument internally informs the external circuit PASS signal pin.
Pin3 (/FAIL I/O): output signal, instrument internally informs the external circuit Fail signal pin.
Pin4 (/BUSY I/O): output signal, instrument internally informs the external Testing signal pin.
Pin5 (EXT_Vcc): The instrument's external 5V power.
Pin10 (BREAK I/O): input signal, semi-automatic or automation device informs to enter Test mode.
Pin11 (MODE I/O): input signal, the instrument can be chose the Sample mode /TEST mode.
Pin12 (/START I/O): input signal, the manual trigger mode control pin.

Note: The above-mentioned functions must be based on actual factory specifications. Some of the instruments do not have these functions.

8-2 HANDLER Internal Circuit Diagram



8-3 Sequence Control Procedure

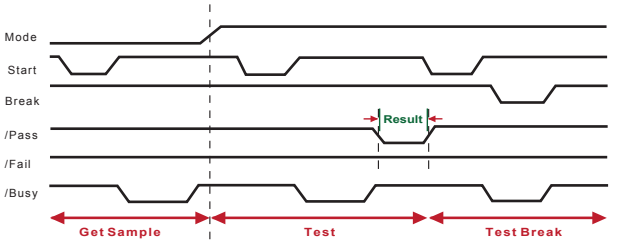


Illustration of Sample Mode (Manual Mode) Flow Process:

Step 1:
External: The user shall set "Normal Testing Procedure" or "Standard Sampling Procedure" at first. If it is a normal testing procedure, it requires connecting the "MODE" signal to logic Low level. If it is a standard sampling procedure, it requires connecting the "MODE" message to logic High level, while /Start (Input) control pins are maintained at logic Low level.
Instrument : /Busy (Output) High Level indicates readiness to receive external control.
Note : For testing procedures, pleases make sure there is any
sampling waveforms at first.

Step 2:
External: The user sets the /Start (Input) control pin to the logic High level, after holding for 0.2-1 second return to the logic Low level.
This action will inform the instrument to enter the test or the sampling procedure. /Start is After-triggering access procedure.

Step 3:
Instrument: After entering the test, the instrument will shift the /Busy (Output) signal from High to Low, and inform of current external test. PASS I/O (Output) and FAIL I/O (Output) are High.
Note: Do not touch the test target during the test to avoid electric shock.

Step 4:
Instrument: After the test finishes, the test result will be displayed by changing the /PASS or /FAIL to Low. And, then shift the /Busy (Output) from Low to High to inform that the external test finishes. The test
target can be taken out.
Note: After the test, /PASS (Output) or /FAIL (Output) will be retained until reboot /Start re-trigger the signal will be reset again.

Repeat Step 1~4 to manually and continually do test.

8-4 External Interruption (break)

Step 1:
External: The user shall set "Normal Testing Procedure" or "Standard Sampling Procedure" at first. If it is a normal testing procedure, it requires connecting the "MODE" signal to logic Low level. If it is a standard sampling procedure, it requires connecting the "MODE" message to logic High level, while /Start (Input) control pins are maintained at logic Low level.
Instrument: /Busy (Output) High Level indicates readiness to receive external control.
Note: For testing procedures, pleases make sure there is any sampling waveforms at first.

Step 2:
External: The user sets the /Start (Input) control pin to the logic High level, after holding for 0.2-1 second return to the logic Low level. This action will inform the instrument to enter the test or the sampling procedure. /Start is After-triggering access procedure.

Step 3:
Instrument: After entering the test, the instrument will shift the /Busy (Output) signal from High to Low, and inform of current external test. PASS I/O (Output) and FAIL I/O (Output) are High.
Note: Do not touch the test target during the test to avoid electric shock.

Step 4:
Instrument: User can trigger a Break signal to interrupt the test. User sets logical level at Low for0.5-1 seconds and then sets logical level at High. Instrument stops generating impulse and shows a “User Interrupt!” message on LCD to advise user the test has been interrupted. If user wants to resume testing, please execute the procedures in Step 2.

Chapter 9 RS232 Hyper Terminal Remote Control Command

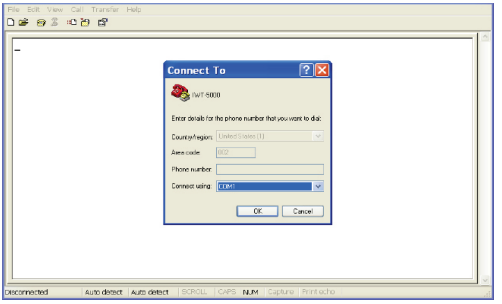
9-1 Initial Connection Setup

Please use the standard RS232 9-pin cable. RS232 cable male connector is connected to the instrument on the left side of RS232 terminal, and female connector was connected PC, to complete the initial connection.

9-2 How to Use Hyper Terminal Testing

Users can open the Hyper Terminal software working in Windows98/ NT/2000/XP operating system. The setting process as below picture:

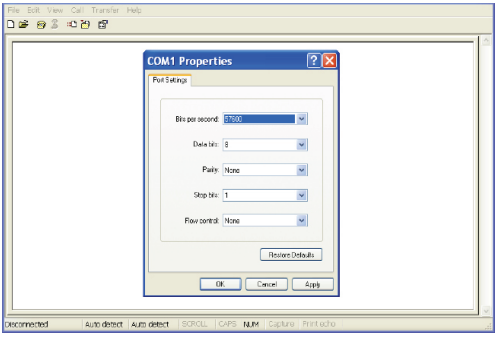
Step1 : Process under the Hyper Terminal



After connection, user can see the above window settings. Before setting, please make sure that the IWT ports have been set, and the terminal should be assigned to the correct IWT COM Port. Otherwise, the terminal would not be able to carry out this function.

Note: The above-mentioned functions must be based on actual factory specifications. Some of the instruments do not have these functions.

Step2 : Setup communication parameter

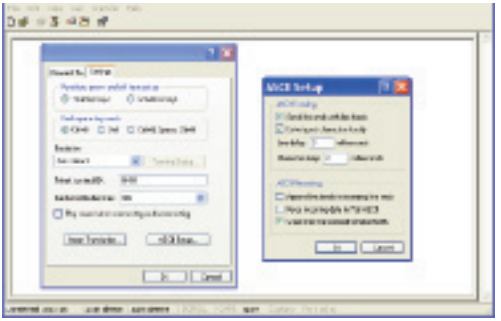


Follow the processes for setup IWT and PC communication parameters:

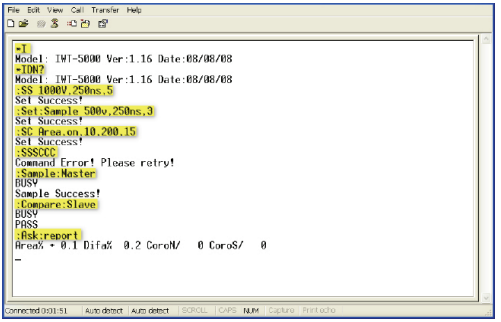
1. Bits per second: 57600bps
2. Data bits: 8 bits
3. Parity: None
4. Stop bits: 1 bit
5. Flow control: None

After setting, please press "OK" to open Hyper Terminal connectivity.

Please select functions list in Hyper Terminal:
Click File\IWT Properties \ASCII Setup
When below dialog box appears, pleases click "send line ends with line feeds" and "Echo typed characters locally" options that will allow users to enter command and see the typing command and the responding message easily.



Step3: Execute command



After the previous two processes, user can test the functions of the Hyper Terminal. The detailed commands can be seen on the "8-3 The Hyper Terminal Control Command Quick List ". So that, the user will access with the effective commands and understand the correct commands for input. As picture, the yellow parts are the user input commands, and the other messages are the instrument responses.

Note 1:

User can't input ":Download:Master" and ":Upload:Master" commands to Hyper Terminal. Both of the commands should be used together with the "9-4 Upland & Download Transfer Protocol" which is used under the development tools for program writing. For more details please see the Demo Software in the CD-ROM.

Note 2:

The above mentioned images and logos all belong to their legal registered companies

9-3 Hyper Terminal Control Command Quick List

Abbreviation	Command	Parameter	Description
*I	*IDN?	N/A	Inquire the mode number and system version of IWT
*R	*RST	N/A	Reset the system.
:SR	:Sys:Rm	ON / OFF	Enter or exit Remote control mode.
:SK	:Sys:KL	ON / OFF	Lock or unlock keypad of IWT.
:SB	:Set:Beep	ON / OFF	Turn Beep on or off.
:SS	:Set:Sample	Volt,Div,Times	Set test voltage, sample rate (Time/DIV) and test frequency.
:AS	:Ask:Sample	N/A	Inquire current test voltage, sample rate (Time/DIV) and test frequency.
:SC	:Set:Compare	AREA, ON/OFF, CursorL, CursorR, MAX Percent	Set the range and parameter of AREA SIZE comparison.
:SC	:Set:Compare	D_AREA, ON/OFF, CursorL, CursorR, MAX Percent	Set the range and parameter of DIFFERENTAL AREA comparison
:SC	:Set:Compare	CoroN, ON/OFF, CursorL, CursorR, MAX Number	Set the range and parameter of CoroN comparison.
:SC	:Set:Compare	CoroS, ON/OFF, CursorL, CursorR,MAX Number	Set the range and parameter of CoroS comparison
:AC	:Ask:Compare	AREA / D_AREA / CoroN / CoroS	Inquire the range and parameter of appointed comparison method.
:SM	:Sample:Master	N/A	Test Master coil according to current test voltage, sample rate and test frequency.
:CS	:Compare:Slave	N/A	Test Slave coil, compare Slave waveform with Master waveform and define PASS/ FAIL.
:AR	:Ask:Report	N/A	Inquire the data of Slave coil.
:M	:Move	1. CACHE0~CACHE5, Master 2. Master, CACHE0-CACHE5	1. Move Master waveform to CACHE. 2. Move the data of waveform CACHE to Master memory.
:LM	:Load:Memory	1. FileName, Master 2. FileName, CACHE0~CACHE5	1. Move appointed file to Master memory. 2. Move appointed file to CACHE
:VM	:Save:Master	FileName	Store the data of Master waveform in appointed Memory.
:EM	:Del:Memory	FileName	Select file name and delete it.
:FL	:File:List	N/A	Send the saved file name to PC. IWT sends "EOF" when all file names are sent to PC.
:DM	:Download:Master	N/A, refer to Chapter 9-4	Download waveform from IWT to PC.
:UM	:Upload:Master	N/A, refer to Chapter 9-4	Upload waveform from PC to IWT.

The Hyper Terminal control commands support Simplified and completed codes. According to the above list, user can set the parameters and CACHE comparison function. As the follow examples:

1. None-parameter Sample –
   Inquire version of the instrument model.
   Use other development tools to send commands, please send 0DH 0AH after command.
   Hyper Terminal Test; please press "Enter".
   Send command to the the instrument - * Idn? <0DH> <0AH> Or abbreviated command - *I <0DH><0AH>
   If user inputs wrong commands as *IDD? or *Id n?, etc. , the instrument would send error message "Command Error!Please retry!".

2. Parameter Sample 1
   Setup system Beep open or close. Use additional parameter, please add a Space after command. According to follow description input parameters. Please send command to the the instrument - :Set:Beep on <0DH><0AH> Or abbreviated command - :SB on <0DH><0AH>

3. Parameter Sample 2
   Store Master waveform as an appointed file name into the instrument. Use additional parameter in memory, please add a Space after command. According to follow description input parameters. Enter the file name to be saved, with at most 10 characters.
   Please send command to the the instrument –
   :Save:Master WAVEFORM01 <0DH><0AH>.
   Or abbreviated command - :VM WAVEFORM01 <0DH><0AH>.

4. Parameter Sample 3
   Load appointed file to the Master waveform. Use additional parameter in Master waveform, please add a Space after command. According to follow description input parameters. Enter the file name to be loaded, with at most
   10 characters.
   Please send command to the the instrument –
   :Load:Memory W AVEFORM01, Master
   <0DH><0AH>
   Or abbreviated command - :LM WAVEFORM01, Master <0DH><0AH>

5. Parameter Sample 4

Set range and parameter of appointed comparison method(Area Size). Use additional parameter, please add a Space after command. According to follow description input parameters, see below "Parameters Definition and Range List ".

Please send command to the the instrument - :Set:Compare,on,10,200,15 <0DH><0AH> Or abbreviated command - :SC Area,on,10,200,15 <0DH><0AH>

Parameters Definition and Range List

Parameter Name	Range	Definition
ON	-	Open
OFF	-	Close
Cache	Cache0~Cache5	IWT Cache, name from 0 ~5 : Cache0/ Cache1/ Cache2/ Cache3/ Cache4/ Cache5
FileName	-	Saving or loading file name, with at most 10 characters.
Master	-	Master waveform
Area	-	Comparable parameters of area ratio Comparable parameters of area-difference ratio comparable parameters
D_Area	-	DIFFERENTAL AREA comparison
CoroN	-	Comparable parameters of corona number
CoroS	-	Comparable parameters of corona amount
Volt	500V~5000V	Test sampling Volt, 100V to a unit step
Div	250ns、500ns、1us、2.5us、5us 10us、25us、50us、100us、250us	Sample rate
Times	1~15	Test average times.
CursorL	0~249	Left side of cursor parameter, CursorL must be lower than CursorR.
CursorR	1~250	Right side of cursor parameter, CursorR must be higher than CursorL.
Max Percent	0.1%~99.9%	Max Tolerances percentage
Max Number	1~999V	Max Tolerances number V

Note 1: If enter error parameter range, the instrument would send message "Invalid parameter".

Note 2: The above-mentioned functions must be based on actual factory specifications. Some of the instruments do not have these functions.

9-4 Upland & Download Transfer Protocol

1. Setup Transmission Environment
   Upland & Download the Transfer Protocol apply only to IWT command: Download:Master and :Upload:Master(:Upload:Master means IWT upload data to PC; Download:Master means download data form PC to IWT)
   Communication Parameter Setting: Baud rate: 57600bps, No parity, 8 bits, 1 stop bit.

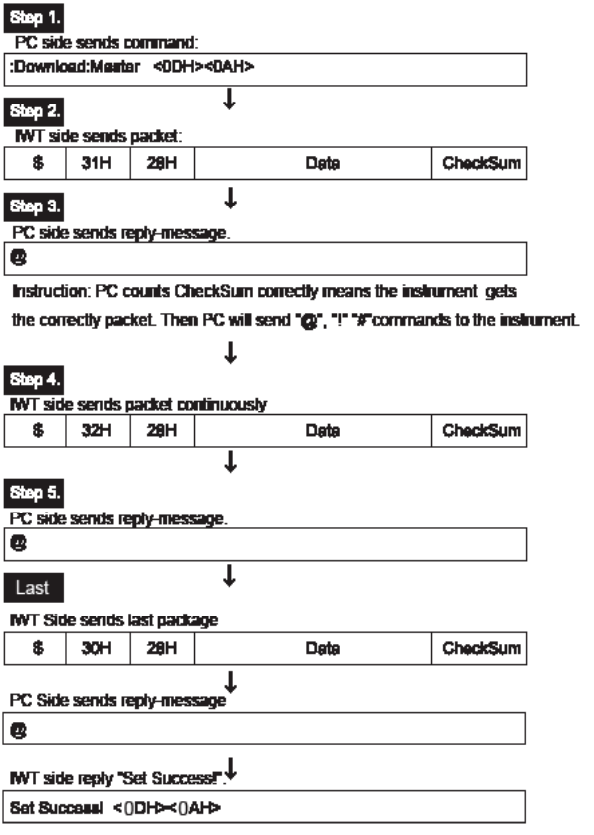
2. Send / Receive Signal Packet block

Recall	Type	Length	Data	Check Sum
←1Byte→	←1 Byte→	←1Byte→	← 40Byte →	← 2 Byte →
ASCII	ASCII	HEX	HEX	HEX

3. Send Signal block instruction:
   (1) Recall: beginning code for one '$' (format: 1 Byte ASCII code)
   (2) Type: the main transmission modes for the following (format: 1 Byte ASCII code):
   '0' : The end signal, final signal.
   '1' : Start transfer the first data.
   '2' : Continuous transfer data
   (3) Length：Definition of data length, can be written into range is 40Bytes.
   Format: 1Byte of a hexadecimal data
   (4) Data: According to Length appointed send / receive data
   Format: 40Byte of a hexadecimal data
   (5) CheckSum: The total length of the CheckSum values.
   Format: 2Byte of a hexadecimal data, first put HighByte, and then put LowByte. Account range is the sum of all the information besides CheckSum. The total number is 43bytes.

4. Each packet communications, the recipient respond the message means (format: 1 Byte ASCII code):
(1) '!': Re-transmission of data
(2) '@': Send the right data
(3) '#': Give up the transmission of data

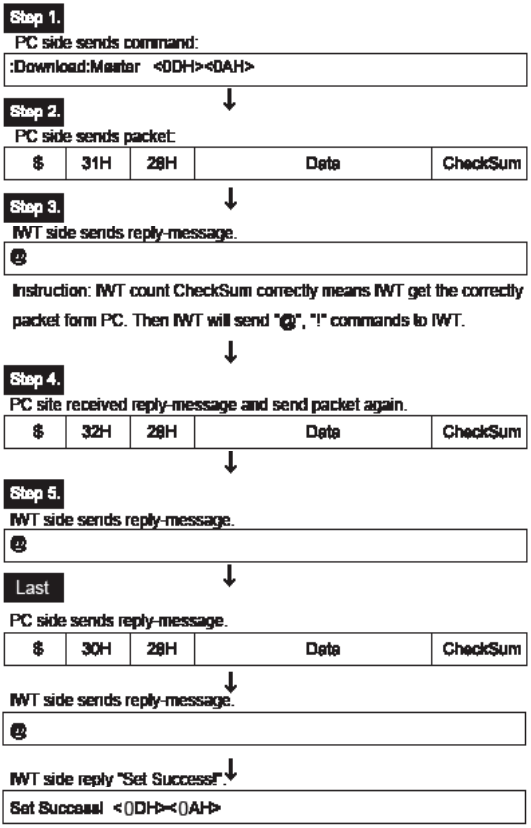
5. Upload Master sample:



Note:

1. Using Upload Master command, if IWT without creating Master Waveform, the back of command would respond warning message '!' , and finish the message.
2. The total number of packets is 126 times. When getting the last Type section for 30H (ASCII ='0 '), means received completely.

6. Download Master sample:



Note:

1. The total number of packets is 126 times. When getting the last Type section for 30H (ASCII ='0 '), means received completely.

9-5 Sample of Remote Command

1. Sample1: Select comparison method and set parameter. Get data of standard waveform and then test DUT.

*rst	// Reset system
:sys:rm on	// Enter Remote control mode
:Set:Sample 2000V,250nS,1	// Set test voltage: 2000V, sample rate (Time/DIV): 250nS and test frequency:1
:Set:Compare AREA,on,10,200,105	// Start AERA comparison, range: 10-200, acceptable differential percentage: 10.5%.
:Set:Compare D_AREA,on,5,180,151	// Start D_AERA comparison, range: 5-180, acceptable differential percentage: 15.1%.
:Set:Compare CoroN,on,15,210,25	// Start CoroN comparison, range: 15-210, acceptable number of Coron:25
:Set:Compare CoroS,on,15,210,15	// Start CoroS comparison, range: 15-210, acceptable amount of Coron:15
:Sample:Master	// Test standard coil
:Compare:Slave	// Test DUT, compare it with standard coil and define test result as PASS or FAIL.
:Ask:Report	// Inquire every parameter of DUT

2. Sample2:Load data from IWT to PC and then test DUT.

:sys:rm on	// Enter Remote control mode
:Load:Memory Test, Master	// Load the file name “Test”that is stored in IWT Memory.
:Compare:Slave	// Test DUT, compare it with standard coil and define test result as PASS or FAIL.
:Ask:Report	// Inquire every parameter of DUT.

3. Sample3:Use CACHE to test 3 different specification coils.

```
:sys:rm on                          // Enter Remote control mode

:Load:Memory Sample01, Cache0       // Load file “Sample01” from Master memory
                                       to CACHE0
:Load:Memory Sample02, Cache1       // Load file “Sample02”from Master memory to
                                       CACHE1
:Load:Memory Sample03, Cache2       // Load file “Sample03” from Master memory
// Test loop                           to CACHE2
:Move Master,Cache0                 // Load CACHE0 to sample waveform(Master).

:Compare:Slave                      // Test DUT, compare it with standard coil and
                                       define test result as PASS or FAIL.
                                    // Process test procedure of the 1st coil.
:Move Master,Cache1                 // Load CACHE1 to sample waveform(Master).

:Compare:Slave                      // Test DUT, compare it with standard coil and
                                       define test result as PASS or FAIL.
                                    // Process the test procedure of the 2nd  coil.
:Move Master,Cache2                 // Load CACHE2 to sample waveform(Master).

:Compare:Slave                      // Test DUT, compare it with standard coil and
                                       define test result as PASS or FAIL.
// Process the test procedure of the 3rd
   coil.
// Repeat test loop.
```

4. Sample4:Upload and Download file.

:sys:rm on	// Enter Remote control mode
:Sample:Master	// Test the first coil
:Move Master,Cache0	// Load CACHE0 to sample waveform(Master).
:Upload:Master	// Upload and save standard waveform (Master).
:Sample:Master	// Test the second coil.
:Move Master,Cache1	// Load CACHE0 to sample waveform(Master).
:Upload:Master	// Upload and save standard waveform (Master).
:Download:Master	// Load file from PC to IWT.
:Move Master,Cache0	// Load CACHE0 to sample waveform(Master).
:Download:Master	// Load file from PC to IWT.
:Move Master,Cache1	// Load CACHE1 to sample waveform(Master).
:Compare:Slave	// Test DUT, compare it with standard coil and define test result as PASS or FAIL.